JUNE.

The usual monthly meeting of the Royal Society was held on Monday, June 11, under the presidency of the Hon. C. H. Grant, M.L.C.

The SECRETARY (Mr. A. Morton) tabled a work entitled "A voyage towards the South Pole performed in the years 1822-24, containing an examination of the Antarctic Sea to the 74deg. of latitude," by James Weddell, Esq., presented by the Rev. J. B. W. Woollnough, M.A., M.H.A.; also "Papers and Proceedings of the Royal Society of Tasmania for 1893." The Secretary drew attention to an innovation in the latter volume, consisting of the inclusion of a form of bequest on the lines adopted by many leading scientific societies.

MERIDIAN OBSERVATIONS WITH THE HOBART TRANSIT INSTRUMENTS.

Mr. KINGSMILL said: The object of my paper is to bring under your notice a piece of astronomical work done at the Hobart Observatory, in the first instance by myself, and afterwards more completely be Captain Cust, of the Dart. This work was the determination of the meridian of the Hobart transit instrument by means of star observations taken with the instrument itself. The American astronomers determined a meridian with great accuracy when they came here on the transit of Venus expedition, and it would be possible to draw a parallel to it by offsets, as the Hobart Observatory is only 57ft. west of their meridian. But this method would be far less accurate than the determination of a fresh meridian by independent observations. There is a meridian mark for the Hobart transit instrument near Mount Nelson, just above the rifle range, and a little to the east of it. A stone something like a milestone has been erected in brickwork with a crosscut in it to indicate the exact meridian. When I came to the Observatory I was told that the cross was wrong, and that the true meridian was close to the eastern edge of the stone, but there was no record of the exact amount of the error. To obtain the exact local time it is necessary to find out all the errors of the instrument. It is by a number of small corrections that accuracy is obtained. However, this error appeared to require a pretty large correction. In December, 1893, I took some observations of the Southern Pole Star and Octantes which,satisfied me that the true meridian was clear of the stone altogether and to the east of it. It happened that there was an iron-dropper in a wire fence very nearly in the right position, and I used this as a temporary mark. It is perhaps not generally known that the Australasians have a pole star of their own considerably nearer to the Pole than the celebrated North Pole Star. But, unfortunately, we cannot see it with the naked eye. Still it can be seen with a telescope of very small power, and it affords an easy and accurate method of determining the meridian. Several other methods were adopted as a check, as follow:—The instrument was first carefully levelled and collimated, then set in a vertical position to observe a star passing directly overhead. It happens that in the latitude of Hobart several stars pass almost exactly overhead. One of these and Phœnicis are only 6sec. from the vertical. By observing the transit of a vertical star the exact time can be obtained with an instrument not in the true meridian. In that position the azimuth error has no effect. Having determined the true time in this way, Octantes, the pole star, was next observed, and followed with the middle wire of the instrument until the time he was due for his transit. Having by this and other methods made sure of the result I wrote to the late Chief Secretary (Hon. Adye Douglas), pointing out the necessity of having the transit instrument exactly in the line of the true meridian; that I had found by a number of star observations that the meridian mark was considerably out of the line, and that it would be necessary to shift the stone; that in its present

position it was useless for the purpose for which it was intended, and asking that my observations as to the error, and calculations of its amount, might be referred to a practical astronomer for verification. The request was referred to Admiral Bowden-Smith, who replied that directions had been given for the Dart to comply with it. Captain Purey-Cust then came to the Observatory, and I placed everything at his disposal. After making a great number of observations he prepared the following report to the Commander-in-Chief of H.M. ships, Australia :—

Difficulty in Ascertaining Correct Time with Transit Instruments at Observatory, Hobart.—H.M.S. Dart, in Frederick Henry Bay, April 5, 1894. Sir,—In accordance with your memo of February 21 as to the above, I have the honour to report as follows :—1. Transit Instrument—The instrument in use is of 2in. aperture, and 22½in. focal length ; it has none of the usual accessories of modern transit instruments, such as micrometer, tangent screw for sideway motion of the eyepiece, reversing apparatus, etc., which greatly facilitate and add to the excellence and accuracy of the observations obtained ; still, in the hands of a carefnl observer no doubt an accuracy sufficient for the purpose required, viz., the rating of chronometers, is obtained. Mr. Kingsmill has lately caused to be added a Bohenbergen eyepiece and amalgamated mercury trough ; this has greatly facilitated the speedy and correct adjustment for collimation and level. The amalgamated form of mercury trough is especially essential on account of the vibration set up by the trams, which pass on either side of the Observatory at a distance of under quarter mile on an average of four times every quarter of an hour. 2. Clocks.—There are two clocks—one, a sidereal in the transit hut, is exposed to every variation of temperature, and in consequence has an ever-fluctuating rate ; the other, a mean solar clock in the Observatory building, has to be corrected every day at noon to exact mean time for dropping the ball, and can therefore be said to have no known rate. Consequently in the event of cloudy weather no dependence can be placed on either of them, and the time is regulated by a single box chronometer kept in the Observatory building. At present there are no ready means of accurately comparing the clock in the transit hut used for observation with either the chronometer or the mean solar clock. At small expense a clock face might be fitted close to the mean solar clock electrically connected with the sidereal clock, affording a simple and extremely accurate method of comparison between the two. This is the method usually employed in all observatories. A good standard clock is much needed ; this could be placed in the cellar for the sake of uniformity of temperature, and electrically connected as above with the room in which is the mean solar clock. 3. Error in Position of the Meridian Mark on Mount Nelson.—In order to obtain this the distance of the meridian mark from the transit instrument was first ascertained by triangulating between the two, using certain data obtained from a local triangulation by Mr. Mault, for a base line. This distance was found to be 6,479ft. A wooden scale was then erected horizontally across the meridian mark, and graduated in arc so as to form a distant micrometer when viewed through the telescope of the transit instrument ; this enabled the azimuth error, as found by observation, to be actually shown in lineal distance at the meridian mark. Observations were made as opportunities offered on various nights of pairs of stars differing considerably in declination, of polar stars and pairs of circumpolar stars at opposite culminations, with the resulting mean deviation of 64″ of arc, showing the present position of the meridian mark to be 2ft. to the westward of the true meridian. This corresponds very nearly with the error that Mr. Kingsmill had previously estimated and allowed for. The probable error of the observations by the method of the least squares is + − 2″6 ; this cor-

responds to a lateral distance of + − 1in. at a distance of 6,479ft. The meridian mark in its present position is quite useless for the purpose intended, and I would suggest that it be moved 2ft. eastwards into the true meridian, and also that there be cut in on the face of the stone, in addition to the present × in circle, a few micrometer teeth on either side, exactly similar to the marking of the present temporary wooden scale. This would enable the residual small errors in azimuth of the transit telescope to be at any time during daylight read off in seconds of arc and allowed for in the usual manner, instead of the frequent injurious alterations of the adjusting screws of the instrument. 4. I would further wish to point out that, although when this alteration is effected, the time by the transit instrument will be obtained with all the accuracy necessary for the purpose, yet that the present means of communicating it to the shipping in port by means of the time ball are quite inadequate and liable to error. Signals are sent from the Observatory to the signalman at the flagstaff, Fort Mulgrave, where the time-ball is situated, by electricity during the last minute previous to 1 p.m. The electrical fittings are so inferior that they frequently break down entirely for days together. Mr. Ellery, the Government Astronomer at Melbourne, whilst recently in Hobart gave as his opinion that this might be remedied by a very simple alteration. Again, the ball is hoisted by a rope and winch, and in order for the ball to appear to drop at 1 p.m. it is necessaryfor the signalman to let go the winch handle a certain time beforehand ; this he does when he sees the last time signal at 2sec. to 1 p.m., he actually lets go about 1sec. to 1 p.m., and the ball itself drops about half a second past 1 o'clock ; by dint of long practice and habit this error is fairly constant, and varies from 0·5sec. to 0·8sec. too late, but it is obvious that the error is liable to variation, and that under the circumstances it is absolutely impossible for the man to drop the ball exactly at 1 p.m. This, I think, might be obviated by some simple automatic method of dropping it, to work with the assistance of a relay by the same electric current from the Observatory as works the time signal. It would be a good plan in future when the time-ball fails in accuracy to hoist it again immediately half-mast, close up at 1·55, and drop it in the usual manner at 2 p.m., publishing the error in the next morning's paper. This is the usual method adopted in many ports in similar cases. 5. Lists of Stars.—The Nautical Almanac is quite inadequate for transit work, especially in south latitudes, by reason of the small number of stars, and especially South Polar stars, for which the apparent places are given. It is seldom or never used, even at the Royal Observatory, Greenwich, the French "Connaissance des Temps," published annually, price 4f. 75c., being much preferable ; *e.g.*, in the "N.A." the App. places of 224 time stars are given, and one South Polar star ; in the "Connaissance" the App. places of 360 time stars, and 11 South Polar stars. I would suggest that this work be added to the Observatory Library. 6. Geographical Position.—The position of the transit instrument has been calculated from that of the transit pier in the Barrack-reserve, used by the U.S. Transit of Venus Expedition in 1874. As this latter stone is the standard of longitude for Tasmania, I would suggest that a permanent record be cut on it giving the exact latitude and longitude. These are furnished by the Melbourne Observatory, viz., lat. 42·53 deg. 24min. 6sec.; long. 147·19deg. 57min. E. I have the honour to be, sir, your obedient servant, Herbert E. Pury-Cust, Lieutenant and Commander."

That is the report, and the colony owes a debt of gratitude to Captain Cust in providing us with it, and for which the colony did not spend one penny.

Mr. Mault urged that the great utility of the work done at the Observatory would be enhanced if the Government would add to the establishment some magnetic instruments.

Mr. E. A. COUNSEL interestingly reviewed the development of time-keeping, and pointed out the great consequence correct time was now in these days of quick communication, and the disastrous results likely to follow to life and commerce in places where railway facilities were numerous it correct time were not maintained.

The CHAIRMAN followed the previous speakers in praise of Commander Cust's work, and hoped that the colony would be long supplied with Mr. Kingsmill's observations. With the assistance of the Leake bequest he hoped that the Observatory would be made one of the permanent attractions of the City of Hobart. Although the present was not a propitious time to approach the Government for assistance, still he thought the Royal Society would help in securing the modest additions necessary to enable the work to be done more accurately.

Mr. KINGSMILL referred to the difficulties experienced with the present arrangements for working the time-ball and gun. The electrical method was the most perfect, and as the use of the current would be but momentary, he suggested that arrangements might be made with the Tramway Company for utilising their powerful current to work the ball and fire the gun simultaneously. (Applause.)

The CHAIRMAN thought that there would be no difficulty in securing such an arrangement.

A NEW EUCALYPTUS.

Mr. L. RODWAY read some botanical notes on new and rare plants, the chief interest centering on a further description of a eucalyptus (described in 1886 by Mr. T. B. Moore, and named *Eucalyptus müelleri*, after Baron von Müeller), from specimens found on the southern slope of Mount Wellington, just below the Springs, where the tree attains a height of 200ft. and more. With regard to the timber he said—"The wood is of a pale red colour, and rather heavy; of a close fibrous texture, of great tenacity, and is commonly used for palings and shingles, but it makes excellent axe handles, and would be very useful for all purposes where considerable strength and toughness are required.

A CORRESPONDENT LOST.

The SECRETARY read a letter from Baron von Müeller, stating that some gentleman in Launceston had asked him for his opinion regarding the reservation of several acres of public land for preservation in its pristine beauty. The answer was delayed, the Baron wishing to send a book with the reply. When the book was obtained, the letter containing the name and address of the correspondent could not be found. The Baron now forwarded the book to the Secretary of the Royal Society to hand to his correspondent if discovered.